UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Summary Review of Monthly Reports*
for
SOIL CONSERVATION SERVICE RESEARCH**

FEBRUARY 1945

EROSION CONTROL PRACTICES DIVISION

Conservation Experiment Stations Section

C. S. Slater of College Park, Maryland reports: "Data on permeability for 43 soils or subsoils were furnished by R. M. Smith, were recalculated and analyzed statistically with the assistance of Mrs. Barlar and Dr. Henry Hopp. The division between capillary and non-capillary pore space was made at the moisture equivalent level. The soil volume (i.e., the space occupied by soil particles) was also considered.

"In simple regression non-capillary porosity was positively correlated, and to a lesser degree capillary porosity and soil volume were negatively correlated with permeability. These relationships commonly are assumed.

"However, when the specific effect of each factor was isolated by the methods of multiple regression, both capillary and non-capillary porosity were found to be positively correlated with permeability, and soil volume had no significant effect.

"The multiple correlation (R) of capillary and non-capillary porosity with permeability was found to be greater than 0.7. When the highly erratic nature of permeability measurements is considered, this degree of correlation seems to indicate that determinations of non-capillary and capillary porosity (at the moisture equivalent level) may furnish a useful measure of permeability."

L. T. Kardos of Durham, New Hampshire reports: "Yields in the topsoil-subsoil mixtures have been summarized in the following table. The effect of the subsoil in depressing yields is very strikingly indicated and its influence is apparently greatest upon the phosphate relations inasmuch as the topsoil phosphate reserve was initially limiting to a greater degree than the topsoil nitrogen reserve. Additional structural and chemical relations are being worked out in the laboratory in order to complete the picture of topsoil-subsoil interaction.

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**All Research work of the Soil Conservation Service is in cooperation with the various State Experiment Stations.

"Topsoil-subsoil experiment (Paxton sandy loam)
Yield* of oats (grams per pot)

Pct. topsoil.....	100	90	75	50	25	
Pct. subsoil.....		10	25	50	75	100
Treatments						
Unfertilized check.....	12.6	13.8	10.1	8.4	5.4	2.9
N**.....	11.5	11.7	10.0	6.8	6.6	4.5
P.....	17.3	15.9	14.75	12.0	9.5	7.0
NP.....	16.2	16.1	14.5	13.5	12.7	13.0
NPK.....	17.0	16.8	15.7	14.3	13.5	13.7

*Yield represents average of two pots and consists of oven dry tops, including grain.

**N = 100 lbs. of nitrogen as 16% $NaNO_3$)
P = 400 lbs. of P_2O_5 as 20% superphosphate) per 2,000,000 lbs. of soil."
K = 100 lbs. of K_2O as 60% KCl)

Oren R. Neal of New Brunswick, New Jersey reports: "Summarization of data to show the extent of erosion and water losses by months and seasons from 1938 to 1944 is in progress. The following table shows the total number of storms that occurred with 5-minute intensities equivalent to rates of 1 inch and of 2 inches per hour.

"Number of storms with intensities of 1 and 2 inches per hour for a 5-minute period from 1938 to 1944

Month	Number of storms	
	Intensity above 1 inch per hour	Intensity above 2 inches per hour
January.....	3	1
February.....	2	0
March.....	2	0
April.....	5	2
May.....	9	3
June.....	24	15
July.....	23	14
August.....	16	9
September.....	15	5
October.....	7	3
November.....	8	2
December.....	2	0
Total.....	116	54
Number storms during growing season (April to October).....	99	51

"It is evident that the storms of relatively high intensity occur most frequently during the months of the growing season. Under storms of comparable amounts of precipitation, soil losses usually vary directly with the intensity of rainfall. A 1-inch rain which falls at a high intensity usually causes a much larger soil loss than does a 1-inch storm of low intensity."

Russell Woodburn of State College, Mississippi reports: "An interesting contrast was provided during some of the February rains between bare land and land with a small amount of cotton crop trash and the same cotton land with a poor stand of vetch. The losses are as follows:

Description	Soil loss - tons per acre	
	Feb. 12/13 - 2.41"	Feb. 16/22 - 4.28"
Bare land on a 9% slope.....	7.6	7.4
Land with a small amount of cotton crop trash - no cover crop.....	0.8	1.2
Land with a small amount of cotton crop trash and a poor stand of vetch.....	0.2	0.5

T. C. Peele of Clemson, South Carolina reports:

"Effects of different tillage methods on runoff and erosion from oats following Kobe lespedeza stubble during the month of February 1945. The rainfall was 7.25 inches.

Treatment	Plot No.	Per cent slope	Runoff, per cent	Soil loss, lbs./acre
Soil mulch-plowed and oats drilled with an ordinary disk drill.....	1	8.90	1.60	11
Soil mulch-plowed and oats drilled with an ordinary disk drill.....	2	8.94	1.27	10
Oats drilled with a Dempster deep furrow drill with no soil preparation.....	3	9.22	0.72	6
Oats drilled with a Dempster deep furrow drill with no soil preparation.....	4	9.17	2.06	27
Soil disked and oats drilled with an ordinary disk drill...	5	7.84	34.40	1521
Soil disked and oats drilled with an ordinary disk drill...	6	8.07	21.72	842

T. L. Copley of Raleigh, North Carolina reports: "Runoff from the red top sod plots has been unusually high during prolonged periods during winter and early spring. Frequent observation during the wet periods indicated that it was seepage water rising to the surface at the junction of the concrete head-wall and plot.

"Borings taken along the edges of the plots during the past month showed that the surface 6 to 8 inches was saturated with water, whereas the subsoil was relatively dry. This indicates that the sandy loam surface soil under the sod has an infiltration rate much higher than its total water holding capacity and that the infiltration rate of the underlying clay subsoil is much lower than that of the surface soil and that underground flow results. The flow continues to the head-wall where it is forced to the surface.

"These observations follow closely results noted in previous years. It has been observed particularly during the winter that water frequently seeped out of the area immediately below the red top sod, indicating infiltration sufficient on the sod plot to cause sub-surface flow and springy condition."

Edgar C. Joy of Brookings, South Dakota reports: "Results obtained from field trials during the period 1939 to 1944 may be briefly summarized as follows:

"Subsurface tillage.-The best results from this type of tillage have been obtained in areas where combines are used to return all straw to the land. Under these conditions, increased crop yields have resulted from the use of subsurface tillage. Weeds have not been so effectively controlled by subsurface tillage in the eastern part of the State but crop yields obtained from field trials have been about equal to those from other types of tillage.

"Tillage and residue results at Highmore Substation.-Tillage and residue trials at Highmore have consisted of three residue applications, straw, manure, and just binder stubble, with one set of each residue treatment plowed under and another set with the residues left on the surface of duckfoot tillage. Wheat yields have been about equal regardless of the tillage or residue treatments. The oats crop followed wheat in the rotation and slightly higher yields were obtained on plowed land as compared to duckfooting. The application of residues made little difference in oats yields.

"Huron tillage results.-A three-year rotation of corn, wheat, oats was used. Over a five-year period various methods of tillage have made little difference in crop yield. The plowed fields, however, have been eroded more by wind and water than where subsurfacing or discing has been practiced. Less weed trouble has been experienced on plowed land.

"Contour farming.-When benefits of contour farming in South Dakota are interpreted on a percentage increase basis the results are:

Southeast Area - Row crops 28.4% increase, small grain 14.4% increase
Northeast Area - No tests made, small grain 15.0% increase
Central Area - Row crops 38.5% increase, small grain 5.7% increase
West River Area - Row crops 33.3% increase, small grain 13.3% increase.

"Contour pasture furrows.-Several years after the furrows were made grass production has been increased an average of 50%. This increase has varied from a low of 30% to more than two and one half times the yield on the unfurrowed part. Different size furrows have been tried since 1938 in various parts of South Dakota. Invariably, furrows smaller than those made with a lister or plow have filled in and become ineffective in a few years time. Some of the most effective and highest producing furrows were constructed with a grader.

"Water spreading on grass land.-During a three year period at Winner grass production was increased from 1,571 pounds per acre where water spreading was not practiced to 2,322 pounds per acre on adjacent land where water was spread.

"Depth of remaining topsoil.-In the southeastern part of the State for the years 1942, 1943 and 1944, soils with normal depth of topsoil have produced an average of 53% higher yields than identical areas in the same fields from which the topsoil had been largely lost by erosion. In the central part around Hurcn the increase was 14% and in the area around Winner it was 57%.

"Grass in bindweed infested fields.-Results obtained from these trials during the past four years have demonstrated that in western South Dakota where rainfall is relatively low the grass can control the bindweed when dense stands of grass are secured. In the central part of the State where more rainfall occurs, the crested wheatgrass has greatly reduced the bindweed but has not been as effective as in drier areas. Good forage yields from the grass were secured so that the land made considerable financial returns during the time the bindweed was being reduced."

D. D. Smith of Columbia, Missouri reports: "The average yield of contoured corn from 19 field tests in Missouri during 1944 was 58.0 bushels per acre, or 5.5 bushels more per acre than from planting up and down hill. Fifteen of the fields had a yield difference in favor of contouring greater than 1.7 bushels per acre, the minimum required for significance.

"In 1943 contoured corn outyielded that planted up and down hill by 8.8 bushels per acre in 15 field tests. The average contour yield for the 2-year period was 63.3 bushels per acre, or 7.2 bushels more than the yield from planting up and down hill. This represents an average additional return of $7.50 for each acre of corn planted on the contour, based on the January 1, 1945 Missouri average farm price for corn.

"The contour yields was enough higher than the yield from up and down hill planting to be considered significant for 27 of the 34 tests during the 2-year period. For 5 tests the yield difference was not significantly in favor of either method of planting. For the other two, which occurred in 1944, there was a significant decrease in yield by contouring. This was due to saturation of the soil for a 2- or 3-weeks period immediately following corn planting, when the excess water could not drain off the contoured area as readily as from the area planted up and down hill.

"For the 1943 tests, and most of the 1944 tests, the yield of corn was higher as the contour row grade was more nearly level. A few exceptions occurred during 1944 in those localities having excess rainfall immediately following corn planting. Here the yield was higher as the contour grade was steeper.

"The average yield of soybeans planted on the contour in 1944 was 25.1 bushels per acre, or 2.0 bushels per acre more than when planted up and down hill. All but one of the 10 trials showed an increase in yield by contouring.

"The 1944 yields were the highest for the 3 years that the tests have been conducted. The 3-year average for contouring, which includes 39 tests, was 23.0 bushels per acre, or 2.2 bushels more than for beans planted up and down hill. At the present Missouri average farm price for soybeans, this represents an average additional return of $4.50 for each acre of beans planted on the contour. The number of stalks per acre has averaged practically the same for the two methods of planting."

H. L. Borst of Zanesville, Ohio reports: "Further study was made of the 1944 runoff data in relation to that of the past several years. Of interest is the finding that a combining or pyramiding of supporting practices is desirable. Where strip cropping, terracing, and damming cultivation have been pyramided for the past 2 years (strips lapping over half the interterrace space) erosion for 2 years has been reduced to less than a ton per acre whereas that from terracing alone (9 year average) was. 3.63 tons."

C. A. Van Doren of Urbana, Illinois reports: "Readings of moisture at various depths in the profile on the corn plots indicate that infiltration has not yet been sufficient to bring the moisture content above the wilting coefficient at 2 and 3 feet depths on many locations in the plots. The existence of this dry portion of the profile indicates ground water supplies have not yet been recharged following the production of the 1944 corn crop."

J. B. Pope of Tyler, Texas reports: "Reforestation planting.- The Loblolly pine seedlings set out on Kirvin and Nacogdoches soils in 1941 have made a very satisfactory rate of growth during the past four years. Many of the individual trees are 12 feet in height and five inches in diameter at the ground level. The planting on the Kirvin area has made a greater rate of growth than the planting on the Nacogdoches area. The average height increase on the Kirvin soil in 1944 was 2.3 feet per tree in comparison to an average of only 1.5 feet on the Nacogdoches soil. Some of the individual trees made as much as 3.5 feet growth in height during the year."

Joel E. Fletcher of Tucson, Arizona reports: "In a study of the effects of soil structure on infiltration, an area that was excluded during one grazing period took 13.7 hours for a six inch irrigation to penetrate, while that adjacent grazed area required somewhat in excess of 30.0 hours. Previous determinations showed this entire difference to be in the surface three-inch layer.

"In a poor spot in a Sudan grass field, treatments of gypsum and sulphur were added to the soil, plowed and replanted to Sudan grass. Infiltration rate was determined approximately six months after the application was made. The results are tabulated below as time in hours required for a six inch irrigation to disappear from the surface of the soil.

Treatment	Time in hours for 6-inch irrigation
Gypsum, 10 tons per acre...	40.8
Gypsum, 2 tons per acre...	40.8
Sulphur, 1 ton per acre....	24.7
Sulphur, 1/2 ton per acre..	27.7
Sulphur, 1/4 ton per acre..	60.8
No treatment.....	64.2

George W. Hood of Batesville, Arkansas reports: "Some interesting data have been compiled, showing the soil loss for three years on several different practices. The figures as set out in the table show that continuous cotton grown in 200 foot rows looses about 65 per cent more soil than where continuous cotton is grown on 90 foot rows. It also shows that continuous cotton, grown on the contour, looses less than 1/3 as much soil as that of the short rows, and less than 1/5 as much as the long rows.

"Another important fact which stands out is that contour cultivation alone will not save soil for a very long period, and that rotations and soil building crops are essential for the most effective control of soil loss. There seems to be very little differences in soil loss from corn, oats and cotton, in rotation either alone or grown together as strip crops when lespedeza and vetch are used yearly as soil building crops in the rotation and where all crops are grown on the contour.

"Soil losses in tons per acre for 1942, 1943 and 1944

Crop and practice	1942 49.67"	1943 34.21"	1944 42.16"	Total tons soil lost per acre
Con. cotton up and down 90' rows.....	26.03	27.49	16.12	69.64
Con. cotton up and down 200' rows.....	35.10	40.20	32.24	107.54
Con. cotton on contour.....	4.47	9.52	7.23	21.22
Cotton in rotation on contour.....	1.29	2.71	2.02	6.02
Corn in rotation on contour.....	1.01	3.38	1.71	6.10
Oats in rotation on contour.....	.53	2.03	2.80	5.36
Strip crop, corn, cotton, oats in rottation on contour.....	1.35	2.60	1.63	5.58
Three year average rot. (cotton, corn, oats) grown separately each year.....	1.40	2.54	1.77	5.71
Bermuda grass.....	0	0	0	0

"However, there was a marked difference in soil loss between continuous cotton grown on contour and cotton grown in rotation with soil improving crops. The loss from the rotation of cotton, corn and oats grown on contour separately amounted to 5.71 tons per acre in 3 years as compared to 21.22 tons per acre where cotton was grown alone on contour. Where these three crops were grown as strip crops all occupying the ground at the same time the loss was 5.58 tons per acre as compared to continuous cotton on contour with 21.22 tons per acre. Thus contour, rotation and soil improving crops lost only about 1/4 as much soil in a three year period. There seemed to be very little difference, in fact, only .74 ton of soil lost per acre whether you grow the crops separately each year or whether you grow them together as strip crops.

"Bermuda grass continues to show no soil loss. This emphasizes the value of pasture grasses or meadow in any rotation where practical."

Harley A. Daniel of Guthrie, Oklahoma reports: "The effect of cultivation on seed and hay production of grass has been studied at the Guthrie Station since 1939. The results are as follows:

"Effect of cultivation on seed and hay production of grass
Guthrie, Oklahoma 1/

Kind of grass	Pounds per acre					
	Hay			Seed		
	Broadcast	21-inch rows	42-inch rows	Broadcast	21-inch rows	42-inch rows
Side-oats 2/.....	1,425	996	845	37	69	57
Little bluestem 3/.....	2,586	2,589	2,119	56	189	240
Weeping lovegrass 4/....	5,243	4,629	4,199	69	77	97
Average.....	3,085	2,738	2,388	54	112	131

1/ All row plantings were cultivated twice with sweeps during the growing season.
2/ Average results of 4 years for hay and 3 years for seed.
3/ Average results of 4 years for hay and 2 years for seed.
4/ Average results of 6 years for hay and 5 years for seed.

"In general, the broadcast areas have produced the most hay and the row plantings the most seed. In fact, the 42-inch rows produced an average of 2.4 times more seed than the broadcast strips. The quality of the seed produced was also considerably higher. From these results, it appears that light cultivation might be beneficial for grass seed production."

Bruno Klinger of Fort Collins, Colorado reports: "On February 5 and 6 soil moisture determinations were made in one of the contour-furrowed pastures. At each site average soil moisture content had increased a little since the preceding determination, made in late October 1944. The increase was confined largely to the upper six inches of soil. In some instances the deeper layers had lost moisture since the October sampling. Comparative data for the first four feet of soil are given in the following table:

"Average moisture content in first four feet of soil
October 27, 1944 and February 6, 1945

Date	Inches of water in four feet			
	Furrowed grazed 1/	Furrowed protected	Blank grazed	Blank protected
October 27, 1944.....	6.97	6.72	5.29	6.44
February 6, 1945.....	7.43	7.61	5.46	7.19
Increase.....	.46	.89	.17	.75

1/ Grazed during summer."

Chares J. Whitfield of Amarillo, Texas reports: "Bindweed, Convolvulus arvensis, has not been considered a serious weed pest in this area until recent years. During the past 10 years, the small patches in many fields have spread and in some areas several thousand acres in a community have a heavy infestation. The Adrian community in Oldham County, Texas has one of the larger areas with a heavy bindweed infestation. According to the farmers, the bindweed entered the community in crop seeds from Northern States and has spread by seed washing great distances, by cultivation, in hauling and feeding sorghum bundles and by cattle carrying seed from infested areas.

"The bindweed is closely linked to wind erosion control in that it is almost impossible to grow an annual cover crop on the infested areas and repeated tillage without adding residue pulverizes the soil. Wind erosion is often a hazard during the spring months on bindweed areas. Some of this infested land has been taken out of cultivation and abandoned to seasonal grazing of the bindweed and other weeds. Many farmers are becoming interested in obtaining a higher return from the land as well as controlling the bindweed and are requesting information on reseeding perennial grasses in an effort to accomplish these aims. At the request of the County Agent, surveys and reseeding plans were made on three farms in the Adrian community and the farmers aided in obtaining grass seed. The plan is to test three grass species in pure stands and two mixtures of grasses to determine the best species or mixture to combat this weed pest and restore the land to production as well as eliminate a wind erosion hazard.

"The use of stubble mulch tillage for the production of wheat and other crops led to its trial in preparing seedbeds for grass. Since wheat stubble cover is often infested with weeds and volunteer wheat in early spring, it is seldom considered a dependable seedbed for grass seeding without some type of tillage to kill weeds and wheat growth. Blue grama and buffalo grass were seeded on wheat stubble cover without tillage just prior to seeding and on wheat stubble cover tilled with a subsurface sweep machine and a oneway just previous to seeding. The plots were packed before seeding. The tilled land produced almost twice as many grass plants of both species as plots seeded without killing competing vegetation by tillage. The stubble mulch tillage gave only slightly better stands than onewaying with blue grama and much better with buffalo grass. The percentage was 11.8 in favor of stubble mulch tillage for blue grama and 32.6 for buffalo grass. Soil moisture samples showed the subsurface tilled plots with most of the residue remaining on the surface to have a higher moisture per cent than the onewayed plots where about 80 per cent of the residue was covered. Since buffalo grass requires a longer germination period than blue grama, the better moisture condition, no doubt, accounts for the stand difference. The stand difference is probably not as significant as the protection afforded against blowing with subsurface tillage. Packing of tilled seedbeds is desirable and subsurface tillage makes the use of packers much safer in early spring without creating a wind erosion hazard."

Hugh C. McKay of St. Anthony, Idaho reports: "During the month of February I was requested to attend two farmers institutes and discuss soil conservation problems in relation to the stubble mulch program. The institutes were held at Downey and Grace Idaho. Approximately 25 farmers were present in the soil conservation section at Downey meeting and 50 at the Grace meeting.

"Considerable interest and discussion was had in regard to the use of crop residue for erosion control. The farmers present realized the need and value of the crop residue, but they had several questions and problems in regard to handling it.

"Considerable discussion was had in regard to the difficulty in handling long heavy stubble such as they have this year. The farmers in these two areas do not have the proper type of equipment to handle heavy residues and extreme care should be used this year in recommending to these farmers the use of all the stubble for stubble mulching. For them to go ahead and try to handle all of the long heavy stubble they have, would probably result in some failures and a poor opinion of the stubble mulch program. The stubble is so heavy in some fields that in running a tandem double disk over it, the disc did not cut the stubble up but merely rode over it. The farmers in this area have only 6-inch double disk drills for seeding their wheat and this type of drill will not seed through a very heavy stubble mulch. It is hoped that the District will have deep furrow drills for use on our field trials in this area this year for demonstrational purposes.

"An effort is being made to make a machine that will cut the stubble up into small enough pieces so that the weeding and seeding equipment the farmers have now will work in heavy residue fields. It is felt that if the stubble were cut into pieces about four or five inches long, we would have no difficulty in later weeding and seeding operations. It is hoped that this will be ready for use this year."

John T. Bregger of Clemson, South Carolina reports: "Trunk circumference measurements were completed on non-plot trees in the six-year old experimental block. These data were compiled with those previously taken on plot trees and are listed in the following table. It is now apparent that the advantage of the Nichols terrace location over the originally smaller interterrace ridges does not extend much beyond the fifth year when the latter are developed into terraces of almost the same size through contour cultivation.

"Peach tree growth based on tree location

Age	Tree location	Number of trees	Average trunk size	Per cent increase
1 year	Nichols terrace ridge	160	15.68*	20.5
1 year	Small ridge	208	13.01	
2 years	Nichols terrace ridge	160	8.70**	27.7
2 years	Small ridge	208	6.82	
3 years	Nichols terrace ridge	160	8.46***	14.6
3 years	Small ridge	208	7.38	
4 years	Nichols terrace ridge	160	9.93	6.2
4 years	Small ridge	208	9.35	
5 years	Nichols terrace ridge	272	12.53	6.5
5 years	Small ridge	559	11.76	
6 years	Nichols terrace ridge	268	13.6	3.1
6 years	Small ridge	484	13.2	

*Diameter in sixteenth of inch.
**Circumference in inches.
***Circumference in tenths of feet.

"A closer analysis of the data on tree growth indicated that the trees planted on the exact top of the Nichols terraces not only outgrew those planted on adjoining interterrace rows, but were also larger than the trees planted on other Nichols terraces at a location two feet below the exact top (ten feet below the terrace channel). In the case of the "two-feet below top" location, the trees on interterrace ridges now average slightly larger, although this difference is not large enough to be significant.

"Peach tree growth based on tree location along terrace profile

Age	Tree location	Number trees	Average trunk size	Per cent increase
6 years	A. Top of Nichols terrace ridge	134	14.0*	6.87
6 years	B. On adjacent interterrace....	216	13.1	(A over B)
6 years	C. Two feet below top N.Terrace ridge.....	134	13.3	.75 (D over C)
6 years	D. On adjacent interterrace ridge.....	256	13.4	5.26 (A over C)

*Circumference in tenths of feet."

T. W. Edminster of Blacksburg, Virginia reports: "The following data are based upon the 1944 results in the stubble mulch project at Blacksburg, Virginia. Tables 1 and 2 present the arithmetic averages for the 6 replicates of each treatment. Sampling consisted of 10 randomized plant depth samples from each plot area, mixed, quartered, and run in duplicate in the laboratory. Frappe's colorimetric method of determination was used.

"Table 1.-Comparison of tillage implements

	Summary of nitrate nitrogen, pounds per acre			
	Plow	Share	Disc	Sweep
April - Untilled.....	47.60	54.73	46.73	54.27
May - Tilled.....	35.13	23.60	11.60	22.80
June - Tilled and cult...	40.73	24.88	12.40	22.66
July - Tilled and cult...	39.84	22.00	12.60	19.40
August - Tilled and cult...	51.56	23.89	22.51	55.03
Sept. - Tilled and cult...	27.73	42.98	41.80	30.95

"Table 2.-Comparison of cultivation implements

	Plow		Share		Disc		Sweep	
	Chisel	Sweep	Chisel	Sweep	Chisel	Sweep	Chisel	Sweep
April - Untilled.....								
May - Tilled								
June - Tilled and cult..	38.07	43.40	23.77	26.00	11.13	13.67	19.60	21.73
July - Tilled and cult..	39.27	40.40	19.60	24.40	10.93	14.27	21.33	17.47
Aug. - Tilled and cult..	54.53	48.60	23.00	24.77	24.43	20.60	28.40	26.63
Sept. - Tilled and cult..	29.23	26.23	39.70	46.27	42.63	40.97	39.37	22.53

"Statistical analysis by the Virginia Agricultural Experiment Station Statistical Laboratory showed the following results:

Month	Tillage	Cultivation
April	No significant difference	Not yet cultivated
May	<1.0 pct.	---
June	<0.5 pct.	No significant difference
July	<0.5 pct.	
August	<0.5 pct.	
September	No significant difference*	

*There was a significant difference of <5 pct. between replicates.

"The following summary of statement may then be made. Turn-plow tillage consistently gave the highest reading of available nitrate nitrogen. The share- and sweep-tillage practices were relatively similar, but consistently lower than the turn-plowed practice. Disced plots consitently showed an extremely low availability.

"There appeared to be no significant difference in the nitrate nitrogen level as affected by the type of cultivation tool."

Alvin E. Lowe of Garden City, Kansas reports: "The wheat plots on the basin project look the best they have any spring since the project was started. The growth covers the ground so there is no danger from wind erosion except along the edges where the weeds had taken the moisture and delayed germination of the wheat. Even that looks better than the plots have in past years. There is danger of this wheat, which is on fallow, becoming too rank and using up the abundance of soil moisture before harvest if we have average or below average precipitation. It is, therefore, hoped that March will be too cold for wheat growth until the middle of the month or later.

"The three continuously cropped plots are quite different from the fallow plots. There is a good stand of wheat but it has not stooled nearly so much. Due to the dry fall a year ago a stand of wheat was not secured on them so they were planted to Flynn Barley last spring. This barley volunteered a heavy stand after wheat planting last fall and most of it has survived the winter. It also started growing during February and it is hoped a cold spell will kill it, but that is doubtful. It survived the 2 degrees below zero during January because of snow protection. This difficulty with the continuously cropped plots emphasizes the advantage of freedom from volunteer that the fallow system of farming has over continuous cropping out in this semi-arid area where rate of planting is so important."

Hillculture Section

J. M. Aikman of Ames, Iowa reports: "Mr. David Llerena, on the staff of the Commissioner of Agriculture of Mexico, visited the Floris Station on February 12 and 13. He was especially interested in hillculture experiments in permanent agriculture which may be applicable to crops, soils and climatic conditions of Mexico. Because of the wide variety of plants adapted to their climate, there would seem to be unusual opportunities for the development of integrated plants of crops of varied growth habits. The small size of many of their farms and the greater abundance of labor would seem to be conducive to the development of Hillculture in Mexico.

"In February the Project Supervisor conferred with work groups at Elkader, Marion and Keosauqua relative to the selection of specific hillculture developments, including crops and techniques, for inclusion in the farm plans of the Districts. Tentative plans for obtaining research data from established and contemplated practices in the Districts were discussed. Mr. Lester Clapp, Extension Soil Conservationist, sat in on the Marion conference and Mr. Kenneth King, Assistant State Conservationist, participated in the Keosauqua conference. At Elkader, Commissioners from two districts were present and took a very active part in the discussion.

"Red pine, Austrian pine and western yellow pine have been successfully establihsed on Lindley loam from which the A horizon and all but 2 feet of the B horizon has been removed. Best results were obtained with red pine and next best results with western yellow pine. The differences in

rate of growth of red and yellow pine were not so great in less severely eroded Lindley loam. As shown in the table red pine grew surprisingly well on all three sites of the experiments. The computation of the size of the crown from overall measurements of height and basal diameter seems to be an effective method of evaluating growth differences during the period of establishment.

"Annual height growth and size, in 1944, of species of pine planted in 2-foot scalps in a denuded Lindley loam site, in bluegrass sod on Lindley loam with 10 inches of topsoil and in bluegrass sod on Plainfield sandy loam

Soils of planting sites, species of pines planted	Height, inches, 1940	Rate of growth, inches				Measurements, 1944		
		1941	1942	1943	1944	Height, feet	Diam. inches	Crown, cu.ft.
Lindley loam, B horizon								
Pinus resinosa.....	8.9	5.7	10.7	13.7	18.6	4.8	1.4	15.5
Pinus austriaca.....	11.3	5.2	7.9	9.9	14.9	3.9	1.3	8.9
Pinus ponderosa.....	5.9	5.2	8.3	8.8	12.6	3.4	1.1	5.5
Lindley loam, 10-inch A horizon								
Pinus resinosa.....	6.6	8.0	10.3	13.7	17.8	4.7	1.6	15.1
Pinus ponderosa.....	12.9	7.2	12.3	9.7	15.5	4.8	1.7	12.9
Plainfield fine sandy loam								
Pinus resinosa.....	14.1	10.3	13.8	16.4	19.8	6.2	1.6	25.8
Pinus ponderosa.....	12.2	8.7	9.0	11.7	13.7	4.6	1.3	9.0

DRAINAGE AND WATER CONTROL DIVISION

Hydrologic Land-Use Studies

North Appalachian Experimental Watershed at Coshocton, Ohio - L. L. Harrold reports: "Records of soil temperature indicate that temperatures were consistently higher this winter than for any previous winter since the beginning of record. This was due to the prolonged period of deep snow. The maximum depth of frost for the month was 2-1/2 inches on wheatland and 1-1/2 inches on meadow. Although our records show that the total precipitation during the past 21 months is 21.59 inches below normal, there are no signs of droughty conditions in the root zone, and prospects are good for ample moisture for wheat and for the early part of the corn season.

"A study of lysimeter records shows that about 380 pounds of water was required to produce 1 pound of dry matter in the corn season. In 1941 this amounted to about 17 inches of water for a yield of 80 bushels per acre. During the season 34 gallons of water was required for a single corn plant and during the month of July when the growth rate was the greatest, 1-1/2 quarts of water per day was expended per plant. Most generally the rainfall for July is about one-half of the normal water requirements of corn plants for the month. The July rainfall occasionally exceeds the normal but a considerable portion is lost in runoff as the unprotected soil in the corn fields cannot absorb the rainfall at high rates. In July 1941, rainfall totaled 6 inches and runoff totaled 3.6 inches leaving about 2.4 inches for the corn plants. As these plants used 6 inches of water that month, 3.6 inches of water had to be supplied from the soil."

Central Great Plains Experimental Watershed at Hastings, Nebraska - I. W. Bauer reports: "The following table shows rainfall and runoff for 1944:

	Rainfall	Runoff	%			Rainfall	Runoff	%
Corn contoured	27.06	4.02	14.8	Pasture	PH	27.25	2.78	10.2
Corn str. row	27.08	6.27	23.2	Meadow		28.46	.19	0.6
Corn subtilled	26.04	2.45	9.4		PL	28.53	.32	1.1
Strip crop	27.14	4.40	16.2	Pasture	PH	28.53	1.72	6.0
Oats contoured	15.50	4.72	30.4	Plots 1/	FH	28.53	.27	0.9
Oats str. row	15.64	4.46	28.5		FL	28.53	.06	0.2
Oats subtilled	15.42	3.20	20.7					

1/ PL = Plain, lightly grazed; PH = Plain, heavily grazed; FH = Furrowed, heavily grazed; FL = Furrowed, lightly grazed.

"The figures for rainfall and runoff are for period when ground was prepared for seeding, until ground was prepared for next crop. Corn from April to end of year; oats from April to August. Pasture and meadow for entire year. All figures are average of two plots."

Hydrologic Studies at LaFayette, Indiana - R. B. Hickok reports: "Several test plots have been started to study methods of utilization of corn residues by the ensuing wheat crop. Six test methods are being tested in triplicate as follows:

On wheat fertilized with 450 pounds, 0-14-7 at seeding (Conservation Treatment)

1. Mulching with manure
2. Mulching with shredded corn fodder
3. Mulching with shredded corn fodder and manure
4. Mulching with shredded corn fodder and top dressing 20 pounds nitrogen in April.
5. Check

On wheat fertilized with 200 pounds, 0-14-7 at seeding (Prevailing)

6. Mulching with shredded fodder.

(Fodder applications 2 tons/acre, manure 4 tons/acre)

These tests are designed to test possibilities of direct return of the corn residues to wheat in the future on our experimental watersheds in the 3-year rotation, C-W-M; rather than the present effort to replace the corn residues with manure applied immediately preceding the next corn crop."

Hydrologic Studies at East Lansing, Michigan - R. G. White reports: "Nearly 2 inches of water was either taken into the soil or lost as evaporation at the cultivated watershed, during the latter part of February, and somewhat over 2 inches at the wooded watershed. This statement is based on a study of snow-survey records, and rainfall and runoff records for the 3 watersheds.

Moisture Taken Into Soil or Lost as Evaporation

	Cultivated Watersheds		Wooded
	"A"	"B"	Watershed
Snow-survey of 2/12/45 *	2.09	2.04	2.26
Precipitation after 2/12/45	0.82	0.82	0.82
Total moisture available	2.91	2.86	3.08
Runoff (beginning 2/15/45)	- 1.02	0.98	0
*Snow survey at end of month	0	0	- 0.92
Moisture taken into soil or lost as evaporation	1.89	1.88	2.16

* Snow-survey figures given as "inches of water"

"Solar insulation, as recorded at our pyrheliometric station, was adequate during the last half of February to have evaporated from 80 to 90 percent of the moisture listed as taken into the soil or lost as evaporation.

"At the cultivated watersheds, frost penetrated to a depth of 18 inches under a 5-inch blanket of snow and 12 inches under a 10-1/2 inch blanket of snow, but there was no frost at all under a 20-inch blanket of snow. In the closing days of February, after all snow had melted, some additional frost entered the ground on cool nights in areas that had formerly been protected by a snow blanket.

"At the wooded watershed, snow reached a maximum depth of 12.36 inches on February 12, but was only 4.29 inches on February 26. At no time during the winter has the ground frozen beneath the snow at the wooded watershed."

Runoff Studies

Runoff Studies at Colorado Springs, Colorado - H. K. Rouse reports: "As a phase of the investigation to determine the practicability of applying probability methods to a modified version of a wheat-yield formula developed by H. H. Finnell in connection with long-time precipitation records, records of July rainfall at many stations were examined. A preliminary draft of maps indicating amounts of precipitation which will be equaled or exceeded during 80 percent (4 years of 5), 60 percent (3 years of 5), 40 percent (2 years of 5) and 20 percent (1 year of 5) of the months of July has been made with reasonably satisfactory results. The area studied includes parts

of the 6 states, Colorado, Kansas, Nebraska, New Mexico, Oklahoma, and Texas roughly between 99° and 105° west longitude and 32° and 41° north latitude."

Runoff Studies at Fayetteville and Bentonville, Ark., Muskogee, Okla., and Garland, Texas - V. D. Young reports: "There were 11 days on which precipitation occurred on the Bentonville watersheds during the month of February. The mean of the gages was 6.75 inches which was 3.15 times the Weather Bureau Normal. Between watersheds, the precipitation varied between 6.56 inches and 8.96 inches with the greater amount falling on the wooded area. The largest amount of precipitation occurred on the 20th and 21st within a 13-hour period. This rain produced runoff on all the watersheds except the pasture area W-III. The rainfall-runoff relationship for this rain was as shown in the following table:

Runoff-Rainfall Relationship
Storm of February 21-22

Watershed	Major Soils	Drainage Area Acres	Run-off Ins.	Rainfall Ins.	Run-off %	Rainfall Prec. 30 hrs.	Max. Peak Rate Runoff ins. per hour
W-I	Baxter 59% Centerton Silt Loam 25%	10.03	4.580	3.84	119.3*	.28	1.256
W-II	Baxter	9.34	.255	2.64	.96	.32	.093
W-III	Baxter 84%	14.25	0.	2.69	0	.24	0
W-IV	Baxter	24	1.892	4.10	45.9	.43	.363
W-V	Baxter 35% Centerton Silt Loam 41%	19.4	2.190	4.05	72.1	.36	.689
W-VI	Centerton Silt Loam 49%	10.75	2.037	3.58	79.0	.40	.381

* This indicates that this watershed may have had a broken boundary and was fed from an adjacent contributing area.

(The Cover Notes pertaining to the above table appear on the next page)

Cover Notes

W-I Cane harvested, bound and shocked, all shocks were removed except in small portion. Poor cover.

W-II-W-III Hop clover, lespedeza, native grasses and patches of brush. Good cover with no pasturing.

W-IV Wooded. Good stand hardwoods with plenty underbrush. Thick cover of leaves on ground.

W-V Strip cropped area. Grassed areas pastured heavy. Fair cover.

W-VI Terraced meadow. Fair cover of weeds and grasses or lespedeza and grass.

Precipitation
Watershed W-I

Date	Began Time	Ave Int. Ins/hr.	.03	.30	.94	.52	1.07	.28	1.05
Feb. 21-22	3:40 P	Ins. Prec.	.12 +	.26 +	.25 +	.07 +	.50 +	.28 +	.14+
		Min.	196	52	16	8	28	60	8

Ins Prec.	.31+	.18 +	1.40 +	.28	Total Precipitation	= 3.79"
Min.	32	12	192	116	Time	= 13 hrs.

Hydraulic Studies

Hydraulic Studies at Minneapolis, Minnesota - F. W. Blaisdell reports: "Assembly of a pipe bleeder using 'Lucite' pipe 4-1/2 inches in diameter was completed. The barrel has a length of 20 pipe diameters and is set on a 30 percent slope. The entrance to this pipe consists of a riser 1-1/4 pipe diameters square in plan and 5 pipe diameters deep. It was assembled from 'Plexiglass' sheets. This model has been installed and tried out, but some additional work will be required before testing can begin. Like the pipe-bleeder models previously tested, the barrel flows full even though the outlet discharges freely and the barrel slope is much steeper than that of the hydraulic grade line.

"Mr. Donnelly continued to work on the rectangular-spillway outlet, and he has largely completed the exploratory tests made to obtain information regarding the action of various outlets and possible types of outlets that can be used. These tests showed the necessity of placing a transition between the rectangular spillway and the stilling basin to assist in smoothing out the very turbulent flow. The

transition now being tested is a channel of uniform width having a level floor. The stilling basin will be located downstream from the transition. Forty-six tests were made to determine the length of this straight transition section for several ratios of rectangular spillway length B to width W.

"At the request of Professor Philip W. Manson of the University of Minnesota, the portable operating model showing the benefits of improved designs on the hydraulic capacity and performance of culverts was exhibited during Farm and Home Week."

Hydraulic Studies at Stillwater, Oklahoma - V. J. Palmer reports: "The main calculation work on the 1944 test data has been completed and tabulation and summaries started. A list of the channels tested including description of covers, number and range of test flows was presented in the report prepared at the end of November 1944. An objective attained was the running of very low flows through vegetation in addition to high flows that completely submerge and compress the vegetation. The determination of the character of flow through vegetation and the resistance offered by different vegetations and by various densities of a single vegetation is considered an important phase of our program.

"The dense uniform covers on the unit channels lined with Bermuda grass provided excellent protection. Velocities of 13 feet per second were developed with a depth of 1.8 feet on a 5 percent slope. Only about 3/8 inch of soil was lost uniformly over the channel bed. Of course all surface-mulch material and loose dry material contained in the vegetation was removed and the vegetation had a very "washed out", frayed appearance. The large field size channel, L1B (bottom width 10 feet, side slopes 4 to 1, bed slope 9 percent) was subjected to a maximum flow of 126 cubic feet per second. A depth of 0.9 foot and mean velocity of 10.3 feet per second resulted. Surface velocities approached 17 feet per second. Although scour to a depth of 0.1 foot occurred in some areas, the channel did not fail and the cover remained essentially intact. Caution should be applied, however, to the use of such high velocities in field-channel design since density and particularly uniformity of cover are extremely important. Limiting permissible velocities to 8 feet per second for sod-forming covers is recommended.

"The unit channels tested with long, green weeping love grass (channels U5 and U6 with 5 percent bed slope) suffered severe scour at unit width discharges less than one-fourth those carried safely over Bermuda grass (channels U2 and U3 also with 5 percent bed slope). At velocities of about 5 feet per second severe scour on the upstream side of clumps with exposing of roots occurred and testing had to be discontinued. Higher flows would have resulted in actual uprooting of clumps and failure of the lining. On slopes steeper than 3 percent, the permissible design velocity for weeping love grass should probably not exceed 4 feet per second."

Hydraulic Studies at Prosser, Washington - Stephen J. Mech reports: "The summarization of the soil-moisture data obtained in conjunction with the field trial of the gravemetric soil-moisture measuring plugs was sent to C. S. Slater, Soil Conservation Service, College Park, Maryland. It seems that in Sagemoor fine sandy loam soil the plugs reach their maximum weight at a soil-moisture content of about 14 percent. Though the field capacity of this soil is about 20 percent, the plugs gain no additional weight as the soil moisture is raised to field capacity.

"Analysis of considerable erosion data leads to the conclusion that in many respects erosion under irrigation is exactly opposite to that under natural rainfall conditions. In the first place, the overland or furrow flow in many instances is reduced to zero at or just before it reaches the end of the plot or furrow. Soil losses measured at the bottom of the plot in the conventional manner are less at this point than at any other point along the furrow.

"Secondly since the curve showing the relationship between erosion and rate of runoff or rate of flow is roughly similar to a logarithmic curve, the erosion increases with the size of stream or rate of flow. Thus practices which improve the structure, build up organic matter or otherwise increase infiltration tend to require a greater flow of water in the furrow. This greater flow necessitated by the greater infiltration tends to increase the amount of soil carried in the stream and thus aggravates the erosion problem.

"If the above contention is sound, then the usual soil-conservation practices are not without erosion hazard under irrigation. Of course close-growing crops and/or sprinkler irrigations affords some relief in this paradoxical situation."

Sedimentation Studies

C. B. Brown reports: "During February I made a trip in the Southeast to study the effects of reforestation and conservation work on municipal reservoir watersheds. In Region 2, approximately 189 towns have one or more impounding water supply reservoirs. Surveys during the past 10 years of 45 of these reservoirs show that half of them are losing more than 1% of their capacity annually. Based on the assumption that they will have to be replaced, on an average, before they have lost 60% of their capacity, it is estimated that 33% of them will have a life of less than 50 years and 56% a life of less than 75 years. As their average age is now more than 20 years, it is apparent that a widespread replacement program will be necessary during the next several decades unless silting rates are drastically reduced. Approximately 2,065,000 persons and hundreds of industries in these southern communities will have to pay higher taxes or higher water rates to cover the reservoir replacement costs resulting from lack of erosion control on their watersheds.

"Computations were completed on sedimentation in the Gunpowder Falls Estuary of the Chesapeake Bay. The U. S. Coast and Geodetic Survey charts of 1846 and 1897 were used as a basis to determine the volume of sedimentation during this period. After making a correction for rising tide level (or sinking coastline) based on determinations of the Coast and Geodetic Survey at Baltimore over a long period of years, it was found that 7,356 acre-feet of sediment had been deposited in this Estuary, which has a drainage area of 451 square miles. This is equivalent to a rate of 21.78 cubic feet per acre per year. This affords an interesting comparison with the rate of sediment production of 46.4 cubic feet per acre per year as determined from sedimentation surveys of Loch Raven and Prettyboy Reservoirs, both constructed since 1912 in the Gunpowder Falls watershed. The lower reservoir controls an area of 299 square miles. The trap efficiency of the estuary is believed to be almost as high as that of the two reservoirs. After making allowance for possible difference on this account, and for some unmeasured above-tide deposits in the estuary it would appear that there has been an increase in the rate of erosion of more than 25% for the period since 1912 as compared with the period 1846-1897."

Sediment Studies at the Cooperative Laboratory, California Institute of Technology, Pasadena, California - Vito A. Vanoni reports: "Study of the problem of the control of the Wildwood Wash in San Bernardino County was continued. The Wildwood Wash is an intermittent alluvial stream which has steep grades and moves tremendous amounts of sediment during flood stages. The problem is to confine the stream so it can carry the flow without damage to the bottom lands in the valley. As is usually the case in such streams, the problem is one of handling the sediment, which is considerably different than handling water alone. Damage from such streams can occur either by excessive downcutting of the channel which results in the lowering of the water table and the encouragement of side gullying, or by filling up the channel and allowing the stream to flow out over the valley, depositing sediment on the land. In order to avoid damage of either kind, the channel must be designed so that the stream will neither erode excessively nor fill up. A complete solution to this problem has not yet been achieved by the engineering progession without considerable expenditure for mechanical controls. As is usually the case in soil conservation work, limited funds do not permit the use of expensive mechanical construction and other means must be devised. This means that the factors involved must be known even more closely than in the large flood control projects where funds are available for heavy construction work."

IRRIGATION DIVISION

Water Requirements for Irrigation

Evaporation, Transpiration and Seepage Losses

Method of Estimating Irrigation Requirements - A preliminary draft of parts of a report on "Estimating Consumptive Use of Water and Irrigation Requirements from Climatological Data" was completed by Harry F. Blaney. This report covers irrigated areas in the four western regions of Soil Conservation Service.

Irrigation Requirement Report - Arthur A. Young continued tabulation and discussion of irrigation requirements of crops in California, and data are now available on a few of the important crops in the southern part of the State. Requirements vary according to location and climate and any value suitable for one location or valley may be inadequate for another. Requirements are lower in coastal areas than in warmer inland valleys.

The 7-month irrigation requirement for oranges varies from 18 inches along the coast to 26 inches inland. Requirement for inland peaches during the irrigation months has been shown to be 29 acre-inches per acre. Date palms in Coachella Valley appear to require 91 inches of irrigation during the 12-month period.

Conversion of Seepage-cup Measurements to Canal Seepage - Carl Rohwer reports that derivation of the formulas for converting seepage-cup measurements to canal seepage was completed. These formulas were developed by the late Major O. V. P. Stout, but he did not explain how they were derived. Because the Stout formulas are complicated, a graphical method was developed and tested by Mr. Rohwer, which provides a simpler method of determining the seepage from the seepage-cup measurements. It is believed that the graphical solution will eliminate one of the principal objections to the use of the seepage cup. However, enough observations have not been made with this device, where the amount of seepage is definitely known, to warrant its adoption without further field trials.

Hydraulics of Irrigation

Design, Invention and Testing of Irrigation and Drainage Apparatus

R. L. Parshall reports that the model sand trap is ready for shipment to Portland for observation and testing. A practical design of the metal vane deflector has been prepared. This, a frame structure, for a capacity of flow of about 50 second feet, is intended to meet conditions found in some of the smaller irrigation ditches in the White Salmon River District, Washington, and also along the Virgin River in southwestern Utah. The Utah Power and Light Company has a sand problem in one of the supply conduits leading to a hydroelectric power plant near Salt Lake City. A personal inspection has

been made of this problem and it is believed the metal deflector sand trap will be suitable for correcting the troublesome situation. Materials are being collected to assemble the parts for an acre-foot integrating instrument to be used in connection with a specially designed water-measuring device. Some previous work has been done concerning this new meter and these preliminary observations appear to promise that a moderately cheap and practical instrument can be developed.

Investigation of Sources and Storage of Irrigation Water

Snow Surveys and Irrigation Water-Supply Forecasts

West-wide Snow-Survey Summary - R. A. Work reports that a plan has been worked out with the snow-survey personnel, by which releases for selected magazines of wide circulation will be prepared following April snow surveys, to show graphically the prospective stream flow and reservoir storage. The stream-flow chart will represent the period April 1 to September 30, expressed as a percentage of the stream flow for a 10-year average. The reservoir chart will be similar, the left bar of the chart showing 10-year average storage as percent of capacity, while the right bar will show the total April 1 reported storage as a percentage of total capacity for the reported reservoirs. This chart will disclose for each State whether April, 1945 storage is greater or less than the 10-year average, and how much the reservoirs, as a whole, lack of being filled.

Storage of Water Underground for Irrigation

San Joaquin Valley Cooperative Investigation - Messrs. Scobey and Muckel (Division of Irrigation), Barth (Bureau of Reclamation), Christiansen (U. S. Salinity Laboratory), and Haehl (Consulting Engineer for the North Kern Water Storage District), prepared a summary of various progress reports covering the first season's work for the Central Valley Water-spreading group meeting held on February 28. Recommendations were also made as to what the future procedure should be.

On the 28th a group meeting of representatives from all participating agencies was held in Riverside with Mr. McLaughlin acting as chairman. Plans for continuing the work were discussed and preliminary arrangements made as to what each agency would contribute in the way of technical assistance, finances, etc. The results obtained during the past year were discussed in some detail and suggestions received as to what experiments should be carried on during the coming season. The problem of decreasing infiltration rates has not as yet been solved although it is believed that some of the factors causing the decrease have been discovered.

Infiltration rates were obtained from 43 test ponds located throughout Tulare and Kern Counties in addition to laboratory work on numerous undisturbed cores. The greatest change in rate was on a pond which had an initial rate of about 13 feet per day and 40 days later was 0.20 foot per day. The minimum rate at which water can be spread economically in San Joaquin Valley is believed to be about 1.0 foot per day, and the minimum has been exceeded in a majority of the test ponds after prolonged submergence.

Antelope Valley, Calif. - Two water-spreading test basins were operated during the month. Infiltration rates were found to decrease with continued application of water although the average rate indicated spreading could be done successfully on a large scale. Initial rates of about 12 feet a day in six weeks had dropped to 2 feet a day.

Drainage of Irrigated Land

Broad Study of Extent of Drainage Problems Connected with Irrigation Practices

Imperial Valley Drainage Investigation, California - William W. Fox reports completion of a model tile study tank and three trial drawdown runs. The tank is 2.75 x 12.5 feet and 5 feet high and is equipped with three model tile lines at each of three levels, outletting on one of the long sides of the tank. On the opposite side are 13 sets of 3 manometers. The tank is filled with dry soil, tamped in. Water is introduced from the bottom until the mass is saturated, and studies are made by opening tile lines singly or in combination. The effluent is measured and the position of the drawdown curve is observed in the manometers. Eight undisturbed samples of the soil were taken and permeability runs were made. The first objective is to check the accuracy of the formula developed for calculating tile spacing.

On the basis of soil-moisture samples, William W. Fox reports that consumptive use on the Dorman alfalfa plot during the period October 27, 1944 to February 5, 1945 has ranged from 0.042 to 0.104 acre-inches per acre per day. A preliminary analysis of subsurface seepage rates into the plot indicates that seepage may be only 4 percent as great as consumptive use.

Irrigation Institutions

Studies of Needs, Methods and Practices of the Rehabilitation of Irrigation and Drainage Enterprises

J. S. James is completing his preliminary report to the Montana State Office on water supplies and prospects for supplemental supplies for the west side of the Bitterroot. This report will

indicate the apparent opportunity to solve the water-supply problem for about one-half the area. It will point out that, for the rest of the area, the only immediate, or early, relief will be found in making the most effective use of the present water supply. This will introduce a problem common to much of the Western irrigated area. Its solution will entail readjustment of ownership of water rights, so as to apply the best water service to the best lands, and also reorganization of methods and means of water delivery so that, through rotation, effective heads of water can be provided. The adjustments will require a high degree of understanding, initiative and cooperation on the part of the water users, and present to the Service a special problem in technical assistance. It is a problem of adjusting land and water use to the available water supply, rather than one of determining water requirements for maximum yield per acre. If soil conservation districts, with the assistance of the Service, can effect this type of readjustment, some of the most serious and long-standing problems of irrigation agriculture may be solved.

Studies of Customs, Regulations and Laws Affecting Farm Irrigation and Drainage

Ground-water Law Studies

Hawaii - Wells A. Hutchins reports that final drafts of alternative proposed statutes for the legal control of ground waters on the Island of Oahu were completed and sent to the Honolulu Board of Water Supply, in accordance with the cooperative agreement between the Department and the Board. One draft is based on the theory of public ownership of ground waters, the other on the theory of private ownership. The public-ownership plan, if its validity can be established, should offer better protection to ground-water developments than the other, but it is an innovation in Hawaiian jurisprudence and is not favored by some of the interests affected. The private-ownership plan would conform more closely to extant decisions of the Hawaiian courts and would probably have the better chance of being held constitutional. Full explanation of the alternative proposals and of their advantages and limitations has been sent to the Board of Water Supply for consideration before it decides upon a course of action.